

LHC IR Upgrade

Work outline

Riccardo de Maria

CERN AB-ABP-LOC

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Motivations

Work outline

Studies

Studies at Fermilab

Motivations

The has two high luminosity experiment: Atlas and CMS.

The nominal peak luminosity is $10^{34} \text{cm}^{-2} \text{s}^{-1}$.

After 7 years of operation the IR magnets will reach the radiation damage limit and they will need to be replaced.

An R&D program has been launched in order to identify alternatives layouts able to improve the luminosity performance.

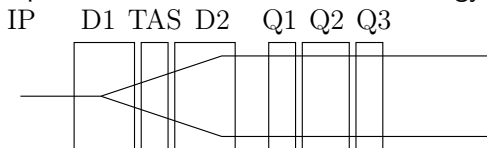
The luminosity goal for the upgrade is $10^{35} \text{cm}^{-2} \text{s}^{-1}$.

A factor 2 is supposed to come from the new IR layout.

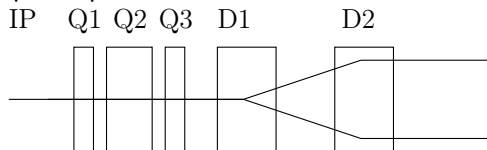
Work outline

My work is focused on alternative layouts:

- ▶ dipole first based on Nb₃Sn technology

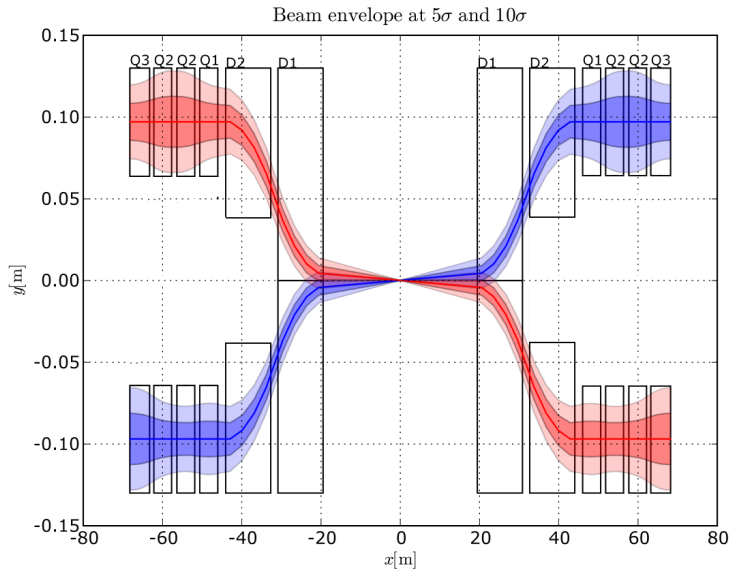


- ▶ quadrupole first based of NbTi technology

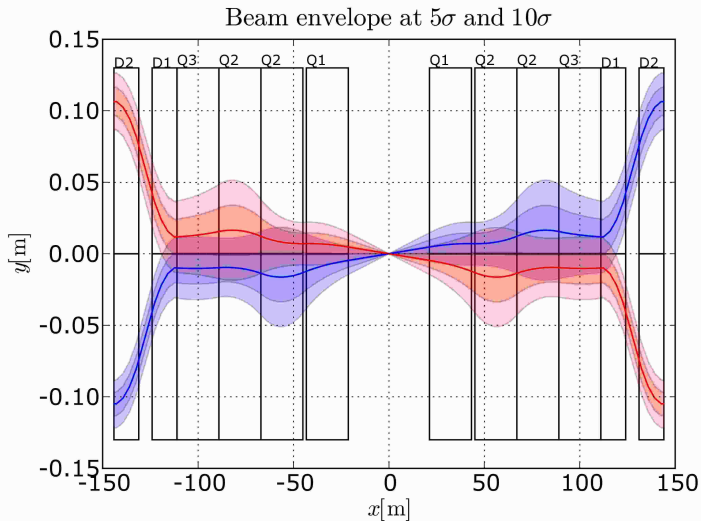


Both layouts aim to reduce β^* from 0.55cm to 0.25cm.

Dipole first Nb3Sn



Quadrupole first NbTi



Studies

My interests are in:

- ▶ linear optic optimization;
- ▶ chromatic aberration and their compensation;
- ▶ DA optimization;
- ▶ radiation protection and heat load;
- ▶ operational limitations;
- ▶ sensitivity to ground motion, power supply ripple;
- ▶ sensitivity to noise and emittance growth.

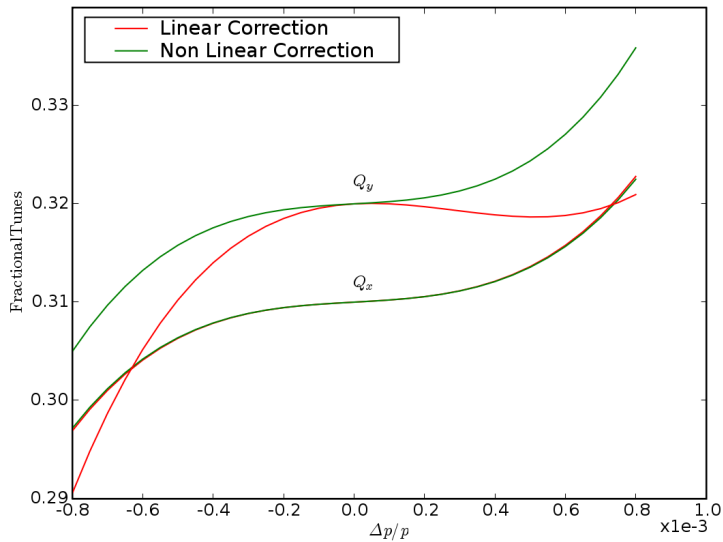
Studies at Fermilab

The purposes of my visit at Fermilab are:

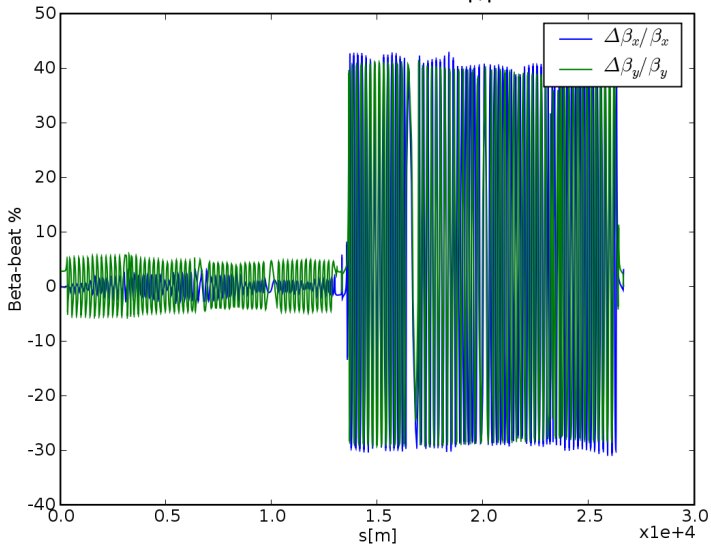
- ▶ start energy deposition studies using MARS, be able to understand the issues and try to optimize the optics to minimize their effects (Nikolai Mokhov);
- ▶ exchange informations about chromatic aberration and strategies for their compensation (Tanaji Sen, John Johnstone);
- ▶ acquire some operational experience of an hadron collider. (TEL beam-beam compensation, Vladimir Shiltsev, Vsevolod Kamerdzhiev);
- ▶ field fluctuation measurement (Vladimir Shiltsev).

end

Tune versus $\Delta p/p$



Off-momentum beta-beat at $dp/p=0.0003$



Chromaticity correction

